

STANDARD FORM 30 (REV.10-83)
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CHAPTER 7: Revised JUL 01, 2003

HVAC

7.0 HEATING, VENTILATING AND AIR CONDITIONING (HVAC)

Project consists of renovation of the air and hot water distribution systems in the existing fire station area and the installation of new heating and ventilating systems in the new apparatus building (refer to chapter 4, ARCHITECTURAL, for locations). During the renovation, openings of the ductwork and piping shall be capped immediately so that the central air systems will be able to continuously serve rest of the building. New systems shall be designed and constructed in accordance with the following requirements:

7.1 GENERAL REQUIREMENTS

7.1.1 Design Standards

Heating, ventilation and air conditioning systems shall comply with the latest provisions, unless other indicated, of the following standards and specifications:

- a. TI 800-01, Technical Instructions - Design Criteria
- b. TI 800-03, Technical Requirements for Design-Build
- c. TI 809-04, Technical Instructions - Seismic Design for Buildings
- d. TI 810-10, Mechanical Design - HVAC
- e. TI 810-11, HVAC Control Systems
- f. TM 5-785, Weather Data
- g. TM 5-805-4, Noise and Vibration
- h. ANSI Standards
- i. ASHRAE Handbooks
- j. ASHRAE Standard 62-2001, Ventilation
- k. ASHRAE Standard 90.1-2001, Energy Efficient Design of New Buildings
- l. ASME Standards
- m. ASTM Standards
- n. UL Standards
- o. NFPA Standards
- p. NFPA 90A, Air Conditioning and Ventilation Systems
- q. OSHA Safety and Health Standards

q. SMACNA Manuals and Guides

r. NIOSH Guidance for Protecting Building Environments from Airborne Chemical, Biological, or Radiological Attacks

7.1.2 Submittals

Submittals shall be in accordance with Section 01330, Submittal Procedures. HVAC system construction shall not begin until HVAC final design has been reviewed and cleared for construction by the government. All submittals shall include adequate descriptive literature, catalog cuts, and other data for the government to ascertain that the proposed equipment and materials comply with this RFP.

7.1.3 Equipment

All equipment shall be factory packaged and tested. Use products of one manufacturer where two or more items of the same kind of equipment are required. Equipment efficiencies shall meet the minimum efficiency requirements indicated from ASHRAE 90.1-2001, unless indicated otherwise in this RFP.

7.2 Design Criteria

7.2.1 Outdoor Conditions (Temperatures indicated are dry bulb unless otherwise indicated.)

7.2.1.1 General -

Latitude - 39 degrees, 3 minutes
Longitude - 77 degrees, 43 minutes
Elevation - 294 feet
Degree Days -
 Heating - 5087
Daily Range - 22 degrees F

7.2.1.2 Heating Season

Design Temperature - 12 degrees F
Design Temperature for Outside Air Coils - -5 degrees F

7.2.1.3 Cooling Season

Design Temperature - 91 degrees F
Wet Bulb - 75 degrees F

7.2.2 Indoor Heating and Cooling Conditions

a. Offices, living, kitchen, dining, and day rooms:

Summer - 75 degrees F, 50% RH maximum
Winter - 68 degrees F, 30% RH minimum

b. Mechanical Room:

Summer - ventilate only, 10 degrees F above ambient
Winter - 55 degrees F

c. Watch/Alarm Room:

Summer/Winter - 75 degrees F, 50% RH maximum (Humidification shall be provided).

d. Toilet Rooms:

Summer - None (Indirect Cooling from adjacent spaces)
Winter - 68 degrees F

e. Janitor Closet:

Summer - None (Indirect Cooling from adjacent spaces)
Winter - None (Indirect Heating from adjacent spaces)

g. Storage:

Summer - not to exceed 96 degrees F
Winter - 55 degrees F

h. Apparatus Bays:

Summer - not to exceed 96 degrees F
Winter - 55 degrees F

i. Training Rooms:

Summer - 75 degrees F - 50% RH plus/minus 5%
Winter - 68 degrees F - 30% RH Minimum

j. Work Room:

Summer - Not to exceed 96 degrees F.
Winter - 60 degrees F.

k. Corridors:

Summer - 75 degrees F.
Winter - 68 degrees F.

7.2.3 Ventilation

7.2.3.1 General

The following definitions apply: recirculated air is room air that can be returned for reuse. Non-recirculated air is room air that cannot be returned for reuse. All areas located on the exterior wall shall be provided with positive pressure to prevent infiltration.

7.2.3.1.1 Recirculated air from offices, living rooms, dining/kitchen area, dayroom, corridor, training rooms, and watch/alarm room

7.2.3.1.2 Non-recirculated air (Exhausted air) from toilet rooms and Janitor's Closet.

7.2.3.1.3 Kitchen

Ventilation for hoods shall be designed for vapor hoods and in accordance with NFPA 96 for grease hoods. Exhaust for grease and vapor hoods shall be discharged vertically through the roof using a hinged, upblast exhaust fan. The exhaust for the grease and vapor hoods shall be enclosed in a 2 hour rated fire separation. The termination of the exhaust shall be at least 10 feet from air intakes.

7.2.3.2 Minimum outside air quantities

- a. Offices - 20 cfm per occupant.
- b. Living Rooms - 30 cfm per room
- c. Kitchen and dining area: 20 cfm per occupant.
- d. Day rooms: 20 cfm per occupant.
- e. Watch/Alarm Room - 20 cfm per occupant.
- f. Toilet Rooms - 50 cfm per water closet or urinal.
- g. Janitor closet - 50 cfm
- h. Storage - 0.15 cfm per square foot.
- i. Workroom - 1.5 cfm per square foot.
- j. Training Rooms - 20 cfm per occupant.
- l. Mechanical Room - cfm shall be based on combustion and temperature reduction requirements.
- m. Corridors - 0.1 cfm per square foot

7.2.4 Filtration of Circulated Air

The existing air filters in the air handling units are adequate for air filtration.

7.2.5 Heating and Cooling Loads

Submit computer program generated heating and cooling loads including building air balance (positive pressure to be provided to preclude any infiltration in the office and living areas) to substantiate design guidelines were met and to size the necessary HVAC equipment. Use a nationally recognized heating and cooling load program such as Trane Trace 700, DOE-2.1E or other program that performs 8760 hourly calculations.

7.2.6 Special Equipment Loads

Obtain heat gain information from the manufacturer for the equipment. Where no information is available, use ASHRAE Fundamentals. The following is, but not limited to, a list of possible equipment (refer to room description for location of equipment):

- a. Copiers
- b. Faxes
- c. Laser Printers
- d. Computers/Monitors
- e. Televisions
- f. VCRs/DVDs
- g. Communication Equipment
- h. Cocking range
- i. Cocking Grill
- j. Refrigerator
- k. Oven
- l. Washer and Dryer
- m. Vending machines
- n. Water cooler
- o. Microwaves

7.2.7 Sound and Vibration Criteria

7.2.7.1 General

ASHRAE Applications Handbook and TM 5-805-4 shall be used for selecting heating and air conditioning equipment, ductwork and air supply devices.

7.2.7.2 Room Requirements

The following NC requirements apply:

Offices, living rooms, and dayroom.	NC-30
Training Rooms	NC-35
Kitchen, dining area, and corridor, workroom	NC-45

7.3 Source of Heating and Cooling

7.3.1 Heating - Heating shall be provided by natural gas. The existing gas meter is at the mechanical room. If required, a new meter may be installed at the apparatus building.

7.3.2 Cooling - Direct Expansion (Dx) systems were used in the existing and new A/C systems.

7.4 Occupancy

Refer to Chapter 5, architectural, for occupancy and hours of operations, and equipment to be included, etc. No reduction in the heating load shall be taken for the internal heat gain due to lighting, equipment and occupancy. People sensible and latent loads for all areas shall be based on light office work conditions as indicated in ASHRAE.

7.5 Antiterrorist and Security Measures

7.5.1 A shutoff switch for the air handler units shall be located in the watch/alarm room for easy access by on duty personnel in the building. See also the NIOSH Publication, Protecting Building Environments for Airborne

Chemical, Biological, or Radiological Attacks, for additional requirements. This publication can be obtained by calling 1-800-356-4674 or E-mail at pubstaft@cdc.gov.

7.5.2 Utilities shall not be located on external walls.

7.5.3 All outside air intake louvers shall be at least 10 feet above grade.

7.6 Testing, Adjusting and Balancing (TAB)

TAB of HVAC systems shall meet the requirements of the UFGS specification 15990A.

7.7 Commissioning

The commissioning of the HVAC system, renovated and new work, shall meet the requirements of UFGS specification 15995.

7.8 Seismic

All equipment shall be seismically protected in accordance with UFGS 13080, Seismic Protection for Miscellaneous Equipment, TI 809-04, Seismic Design for buildings, and UFGS 15070A, Seismic Protection for Mechanical Equipment.

7.9 Room Systems

Generally, systems can be divided into two areas, the renovated area and the expanded apparatus bays. In addition to the existing equipment, a new rooftop unit is required for heating and air conditioning the renovated area. A new heating and ventilation system shall be added for the new expanded apparatus bays.

7.9.1 Renovated area

7.9.1.1 The renovated spaces, except the apparatus rooms, of the existing building are air conditioned by two existing roof top A/C units. One unit serves the original building and the other serves the previous addition of a two stories section. Both are variable air volume (VAV) system with direct expansion DX cooling and bypass. The former is a recent replacement with hot water preheating coil, the later is heated with a natural gas furnace. They are functioning well and adequate in capacity for the spaces they are serving. New air redistribution in accordance with the new room layout is required in this area.

7.9.1.2 The new dorm and day room to be located in the existing apparatus area that is not air conditioned shall be provided with a new rooftop A/C unit. The new A/C unit shall be of DX cooling, gas pre-heating, and bypass VAV type.

7.9.1.3 Except the storage, workroom and bathrooms, Variable air volume system shall be used for air distribution. Air shall be supplied and returned to the air handling units. Reheat coils shall be provided to each of the VAV terminals. Each room shall be provided with a thermostat for individual room temperature control. All ceiling diffusers grilles, and thermostat shall be new.

7.9.1.4 Separate heating and ventilation systems shall be provided for the storage and workroom. Heat source may be either hot water or natural gas from the existing mechanical room.

7.9.2 New expanded apparatus bays

7.9.2.1 Natural gas fired infrared radiant heaters with temperature controls shall be provided between the bays for heating. Nature gas may be run from the existing meter at the mechanical room or, if the capacity of the existing meter is limited, a new gas meter to be installed at the bay area (refer to Chapter 8, PLUMBING). Exhaust from the heaters shall be discharged to the outside of the building.

7.9.2.2 Provide ventilation system for space fume and heat deduction.

7.9.2.3 A vehicle exhaust system shall be provided. System shall include central exhaust fan, exhaust manifold, and hose reels. Each hose reel shall be equipped with tail pipe adaptor and emergency disconnection mechanism and shall be located overhead at the center of the interspaces between the bays. System shall be provided with pressure and temperature sensors for exhaust fan activation.

7.9.3 Exhaust

7.9.3.1 Locations

Exhaust fans for toilet, kitchen, vehicle exhaust and miscellaneous rooms shall be located on the roof.

7.10 Equipment and Materials

Final specification to be developed in accordance with the UFGS specifications and as indicated in this RFP.

7.11 Operation and Maintenance (O&M) Manuals

Complete O&M manuals and training for all HVAC equipment shall be provided as indicated in each technical section of the UFGS specifications.

(Chapter End)

CHAPTER 8: Revised JUL 01, 2003

PLUMBING

8.0 PLUMBING

Plumbing work consists of renovating plumbing systems in the existing fire station and adding plumbing systems in a new expanded apparatus building (Refer to sketches in Chapter 5 for area locations). Renovation includes removing all plumbing fixtures, floor drains, and piping to fixtures. Openings of pipe shall be capped immediately so that the plumbing system in the un-renovated areas is operable. All components to be removed shall be removed out of the building. Abandoned in place is not permitted. The new systems shall be designed and constructed in accordance with the requirements below:

8.1 GENERAL REQUIREMENTS

Complete plumbing and gas piping systems will be provided for the building. The term "plumbing installation" as used herein includes water service including all pipes, fixtures and equipment. A system includes all connections in the building to a point 5 feet outside the building. The plumbing and gas piping systems shall be designed in accordance with the following criteria and specifications unless specified otherwise herein.

- a. International Plumbing Code
- b. Technical Manual (TM 5-810-5) Plumbing
- c. ASHRAE Systems and Applications
- d. Plumbing and Drainage Institute (PDI-WH-201) Water Hammer Arrestors
- e. Comprehensive National Energy Policy Act (PL. 102-486)
- f. American National Standard for Accessible and Useable Buildings and Facilities (CABO A117.1)
- g. Technical Instructions Design Criteria (TI 800-01)
- h. Architectural and Engineering Instructions (AEI) Design Criteria.
- i. Instructions and Guidance to Architects and Engineers Military Construction (Mechanical)
- j. American Gas Association (AGA) - Plastic Pipe Manual for Gas Service.
- k. National Fire Protection Agency (NFPA) 54 - National Fuel Gas Code.
- l. Emergency Eyewash and Shower Equipment - ANSI Z358.1 (1998)

8.1.1 Materials and Equipment

Materials and equipment shall be standard catalog products of manufacturers regularly engaged in production of such materials. All selected equipment shall be manufacturer's latest standard model.

8.1.2 Seismic Requirements

All equipment shall be seismically protected in accordance with UFGS 13080A, Seismic protection for Miscellaneous Equipment; and UFGS 15070A, Seismic Protection for Mechanical Equipment.

8.1.3 Submittals

Submittals shall be provided by the Contractor to the Contracting Officer for approval in accordance with Section 01330, Submittal Procedures. All submittals shall include adequate descriptive literature, catalog cuts, and other supporting data showing compliance with this RFP.

8.1.3.1 Calculations, Drawings, and Specifications

The existing water supply for plumbing facility is adequate. Installation of the plumbing equipment shall not begin until such time that all the calculations, drawings, and specifications are returned stamped "approved."

8.2 PLUMBING FIXTURES AND EQUIPMENT

8.2.1 Plumbing Fixtures, General

Fixtures shall be water conservation type, in accordance with NAPHCC-1. Fixtures shall be provided complete with fittings. All fixtures, fittings, and trim in a project shall be from the same manufacturer and shall have the same finish. Faucets shall be equipped with high efficiency faucet aerators. All faucets, faucet handles, and miscellaneous trim shall be of metal construction with a polished chrome finish. Installation of fixtures for use by the physically handicapped shall be in accordance with CABO A117.1.

8.2.1.1 Lavatory/Sink Faucets

Faucet shall be center set single-control type with seals and seats combined in one replaceable cartridge sized to be interchangeable among similar fixtures such as lavatories or having replaceable seals and seats removable either as a seat insert or as a part of a replaceable valve unit. Water flow for manually operated faucets shall not exceed 2.5 gpm.

8.2.1.2 Countertop Lavatories

Lavatory counter tops and sinks shall be solid surface, polymer molded, integral with counter top, and have a continuous seamless mount. The lavatory shall be the oval type with a minimum size of 19 inches by 16 inches. Lavatories shall have pop-up drain stoppers.

8.2.1.3 Wall Mounted Lavatories

Lavatories shall be manufacturers standard sink depth, vitreous china, rectangular, wall mount, straight back and shall comply with ASME A112.19.1M

or ASME A112.19.2M. Lavatories shall have a pop-up drain stopper, and shall be handicapped accessible with sensor activated valve.

8.2.1.4 Water Closets

Water closets shall be the floor-mounted elongated vitreous china bowl type with top supply spud and white closed-front seat and cover. Flushometer valve shall be large diaphragm type with non-hold open feature, backcheck angle control stop, and vacuum breaker. The minimum upper chamber inside diameter shall be not less than 2.625 inches at the point where the diaphragm is sealed between the upper and lower chambers. The maximum water use per flush is 1.6 gallons.

8.2.1.5 Urinals

Urinals shall be the wall hang vitreous china type with integral trap and extended shields. Top supply connection and back outlet Flushometer Valve shall be Similar to Flushometer Valve for water closet. The maximum water use shall be 3.8 liters 1 gallon per flush.

8.2.1.6 Showers

Showerheads shall be adjustable spray type and shall include a non-removable, tamperproof device to limit water flow to 2.5 gpm. Control valves shall be copper alloy and have metal integral parts of copper alloy, nickel alloy, or stainless steel. Valves shall be thermostatic mixing type. Cabinet shall be free standing cabinet, single unit with receptor; 36 inches wide by 36 inches deep, acrylic fiber construction. Cabinet shall include curtain rod, trim, and concealed fittings. Shower light fixture shall be furnished from the shower unit manufacturer.

8.2.1.7 Emergency Eye Wash

Provide emergency eye wash in the apparatus building (refer to sketches in Chapter 5 for location). Fountain, ANSI Z358.1 eye wash, wall mounted self-cleaning, non-clogging eye and face wash with quick opening, full-flow valves, corrosion-resisting steel eye and face wash receptor. Unit shall deliver 3 gpm of aerated water at 30 psig flow pressure, with eye and face wash nozzles 33 to 45 inches above finished floor.

8.2.1.8 Electric Water Coolers

Electric water coolers shall be self contained, conform to ARI 1010, use one of the fluorocarbon gases conforming to ARI 700 and ASHRAE 34 which has an ozone depletion potential of .05 or less. Min capacity shall be 8 gallons per hour at 50° F with an inlet water temperature of 80° F, while residing in a room environment of 90° F. Unit shall have self closing valves with automatic stream regulators, flow control capability, push button actuated. Exposed surfaces of stainless steel shall have a no. 4 general polish. Spouts shall provide a flow of water at least 4 inches high so as to allow the insertion of a cup or glass under the flow of water.

8.2.1.9 Electric Water Coolers, Handicapped

Handicapped type shall be provided. Unit shall be ADA compliant. Other features shall be as specified above in paragraph: Electric Water Coolers.

8.2.1.10 Kitchen Sink:

Ledge back with holes for faucet and spout double bowl 42 x 21 inches stainless steel ASME A112.19.3M. Faucets shall meet the requirements of NSF 61, Section 9. Cast or wrought copper alloy. Aerator shall have internal threads. Flow shall be limited to 0.25 gallon per cycle at a flowing water pressure 80 psi if a metering device or fitting is used that limits the period of water discharge such as a foot switch or fixture occupancy sensor. If a metering device is not used, the flow shall be limited to 2.5 gpm at a flowing water pressure of 80 psi. The handle shall be Cast copper alloy, wrought copper alloy, or stainless steel single lever type. The drain assembly: Plug, cup strainer, crossbars, jam nuts, washers, couplings, stopper, etc., shall be copper alloy or stainless steel.

8.2.1.11 Service Sinks

Service sinks shall be provided for the janitor closets and apparatus building. Sink shall be enameled cast iron ASME A112.19.1M, copper alloy or stainless steel ASME A112.19.3M trap standard 24 inches wide x 20 inches deep splash-back 9 inches high. Faucet and Spout - Cast or wrought copper alloy, with top or bottom brace, with back-flow preventer. Faucets shall have replaceable seat and the washer shall rotate onto the seat. Handles shall be lever type. Strainers shall have internal threads. Drain Assembly - Plug, cup strainer, crossbars, jam nuts, washers, couplings, stopper, etc., shall be copper alloy or stainless steel. Trap - Cast iron, minimum 3-inch diameter.

8.2.1.12 Floor Drains and Grated Trenches

Floor drains shall be provided in toilets with 3 or more water closets and in areas with condensate producing equipment. Floor drains shall be cast iron with integral seepage pan, and adjustable perforated or slotted chromium-plated bronze, nickel bronze, or nickel brass strainer. All floor drains shall be automatically trap primed. Grated trenches shall be provided at the inlet and outlet of apparatus bays. Trenches shall be cast iron, polymer concrete, or fiberglass providing safe, fast and effective removal of liquid. Grade shall be cast or ductile iron rated for the concerned apparatus wheel load. Trenches shall be slopped to an outlet connecting to the drain piping.

8.2.2 Air Compressors

Existing air compressors shall be relocated to the far end wall of the new apparatus building. Compressors shall be set on concrete pad at least 4 inches above floor with anchor bolts. Compressors shall be provided with floor drains and air intakes with muffler from outdoor.

8.2.3 Gas Regulator/Meter Assembly

The contractor shall determine either another gas regulator/meter assembly is required by analyzing the adequacy of the existing assembly's capacity for the additional heating load of the new apparatus building. If required, regulator/meter assembly shall be sized for the requirement of the new apparatus building and shall be located outside of the apparatus building. The regulator/meter assembly will be provided and installed by Frederick Gas Company on a concrete pad to be furnished by the contractor.

8.3 PIPING (NOT INCLUDING GAS PIPING)

Pipe sizes shall be per the National Standard Plumbing Code. The plumbing systems shall conform to the requirements of the National Standard Plumbing Code. Flow velocities in water pipe shall not exceed 8 feet per second. All piping shall be sloped to permit complete drainage and be properly supported with allowances for expansion and contraction. Water supply piping shall not be buried under concrete floors except where other methods of installation are impracticable. All piping with the exception of individual fixture run-outs shall be completely concealed. Overhead piping shall be concealed above ceilings. Vertical stacks and risers shall be concealed in pipe chases or properly protected from damage. All work shall be installed so as not to interfere with other mechanical and electrical equipment.

8.3.1 Domestic Water Piping

All above grade water piping shall be installed inside the building thermal envelope.

8.3.1.1 Above Ground Water Piping

All above ground piping shall be Type L hard-drawn copper. Fittings for hard-drawn copper shall conform to ANSI B16.22, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

8.3.1.2 Below Ground Water Piping

All underground piping shall be seamless copper water tube, ASTM B 88 type K with brazed joints, or type F soft copper without joints. Joints under the slabs are prohibited. Under slab supply piping shall be limited to building service entrance only.

8.3.1.3 Wall Hydrants

Wall hydrants shall be provided on the exterior of the building in accordance with TM 5-810-5.

8.3.1.4 Apparatus service water piping

Hose connections of apparatus service water shall be provided in the apparatus building on each column. The connection shall be ¾" diameter, quick connection type. The connection shall be 4 feet above floor with an up-stream shut off valve. A hose hook on the column shall be provided below the hose connection.

8.3.2 Sanitary Piping

All sanitary piping shall be concealed. Each fixture and piece of equipment, except water closets and urinals, requiring connection to the drainage system shall be provided with a trap.

8.3.3 Drain, Waste, and Vent Piping

Drain, waste, and vent piping shall be in accordance with ASTM D 2661.

8.3.4 Roof Drainage

Design of roof drainage shall be in accordance with the National Standard Plumbing Code.

8.3.5 Compressed Air Piping

Compressed air manifold shall across the bays. A hose reels with hose and hand valve shall be provided overhead at the center of each of the interspaces between the pays that each hose may serve the apparatus in the adjacent two bays. A shutoff valve shall be provided between the air manifold and each hose reel.

8.4 GAS PIPING

By the contractor's evaluation determines the requirement of a new gas meter. Base utility site plan shows an existing 4 inch gas on the south side of Porter Street about 30 feet from the building. If required, the gas company will make the connection to the existing gas line. The gas company will provide and install the new gas line and meter set assembly. The contractor shall provide all piping required after the meter. Contractor shall provide design calculations for sizing of pipe. Pipe size shall be based on building demand. Installation of the gas system shall be in accordance with NFPA 54, the National Fuel Gas Code, UL-06, the Gas and Oil Equipment Directory, ASME B31.8 - 1999 Edition, and all local/seismic codes. The Baltimore District Corps of Engineers will negotiate the execution and administration of the utility contract.

8.4.1 Gas Connections

Final connections for gas equipment and appliances shall conform to ANSI Z21.45.

8.5 INSULATION

All domestic hot water pipes and all exposed traps shall be insulated in accordance with UFGS 15080.

(Chapter End)